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ABSTRACT

The objective of this study was to show how classroom observation systems measuring different dimensions of student behavior might be used simultaneously to record and analyze classroom process variables used by teachers. The subjects of the study were 71 student teachers, and the four observational systems were the Reciprocal Category System, the Florida Taxonomy of Cognitive Behavior, the Teacher Practices Observation Record, and the Taxonomy of Imagery Provocation. The findings from the four sets of data studied showed that those specific elements of verbal and cognitive behavior which have been identified exist in a state of dynamic interaction. These variables are usually lifted out of their dynamic context and treated as static entities, but the multidimensional approaches can significantly broaden observational perception. (An appendix contains a bibliography and seven pages of data charts.) (SP 003 836 is a related document.) (RT)

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COLLECTING AND ANALYZING DATA YIELDED BY THE MULTIDIMENSIONAL TECHNIQUE FOR OBSERVING CLASSROOM BEHAVIOR

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INTRODUCTION

The study of classroom behavior by direct observation has become a widely accepted research practice. The literature reflects hundreds of studies growing out of the parent work of Anderson, Brewer, Withall, Bayles, and the more recent work of Soar, Brown, Flanders, Hough and Ober. Nearly all of these hundreds of studies deal with a single dimension of classroom behavior and most attempt to relate that dimension to such things as achievement, attitudes, motivation, etc.

A recent departure from the single dimension concept of observing classroom behavior was made recently at the University of Florida. The Florida study was the first attempt reported in which several dimensions of classroom behavior were observed simultaneously.

The present study is patterned after the Florida study, but uses teacher trainees rather than in service teachers as subjects, and looks at four instead of three dimensions of classroom behavior.

THE STUDY

Subjects for the study were 71* teacher trainees selected from the some 250 students who were involved in student teaching during the course of the study. More precisely, the "unit" of observation was the classroom, with the public school students as well as the teacher trainees being observed. Therefore, the potential number of subjects whose behavior could have entered the observations numbers some 2,200 students and teacher trainees.

The four observational systems used to secure data in the present study are the Reciprocal Category System (RCS) (7), the Florida Taxonomy of Cognitive Behavior (FTCB) (4), the Teacher Practices Observation Record (TPOR) (3), and

*Originally, 88 subjects were selected for the study; but those for whom data were incomplete were not carried forward in the final stages of the study.

the Taxonomy of Imagery Provocation (TIP) (8).

The RCS, developed by Ober (7), is designed to assess the verbal dimension of the classroom. A modification of the Flanders system of Interaction analysis, the system includes nine common verbal categories, each of which can be assigned to either teacher or student talk in addition to a single category reserved for silence or confusion.

The FTCB, developed by Brown, Ober and Soar, is an operationalized modification of Bloom's Taxonomy of Educational Objectives: Cognitive Domain (2). It includes a total of 55 single items which are fu.cher divided into seven subdimensions: Knowledge, Translation, Interpretation, Application, Analysis, Synthesis, and Evaluation. Provisions are made for measuring both teacher and student behaviors. Scoring procedures allow subscores for each of the seven subdimensions and a total composite score to be calculated for both teacher and student.

The TPOR, developed by Brown (3), consists of a total of 62 individual items. Predicated on a general philosophy as purported by John Dewey, items are arranged in dyadic order so that the first item of a pair is a nonexperimental teacher behavior and the second an experimental behavior to be calculated.

The TIP, developed by Solomon (8) is designed to assess teacher behavior on a concrete to abstract imagery related continuum. This continuum includes a lower concrete level, three imagery related middle levels, and a higher abstract level. Distinct patterns of imagery related cognitive teacher behavior are identified and the appropriateness with which teachers deal with students at differing levels of cognitive maturity can be subsequently evaluated by means of this instrument.

Classroom observations using the FTCB, RCS, TIP, and TPOR simultaneously were made by four member teams of graduate students in education from West Virginia University. The raw observational data were treated by preparing the 19 X 19 matrices for the RCS, and computing the item, category, and

numerous score totals for the FTCB, TIP, and TPOR. Several measures were selected from the treated data which had proven stability and would lend themselves to the factor analytic techniques. This initial series of 53 measures, derived from the four instruments, was subjected to a principal components factor analysis, with varimax rotation. Subsequently, the rotated factor matrix was analyzed in order to identify clusters of classroom process measures which tend to go together on the basis of a common dimension or factor.

The commonly accepted practice of limiting the number of rotated factors to the number of eigenvalues greater than 1 was used initially. Fourteen factors were rotated, but the structure appeared to be too fractionated for clear interpretation. Thus, fewer factors were rotated and a relatively clear 11 factor structure emerged showing some reflective overlap among the four instruments, and between pairs of instruments.

FINDINGS AND IMPLICATIONS

Although this study is based upon previous research conducted at the University of Florida no previous study has researched all of the dimensions included here simultaneously. And, while antecedent theory and research may be closely related to the present effort, it remains essentially a pilot study.

The broad purpose of this pilot effort was to show how the concept of multidimensionality might be used in recording and analyzing classroom process variables used by teacher trainees during their period of internship in the classroom. Many of the findings showing interrelationships between certain variables that were found both between and among the four sets of data studied here carry implications for the classroom behavior of in-service teachers; but the primary focus of these findings and implications is upon programs of teacher education.

For the most part, findings in the present study were consistent with previous similar studies (Soar, Wood '69) even though an additional dimension of classroom behavior was measured (imagery) and the subjects were teacher trainees rather than in-service teachers.

When students cognitive behavior is central, the level of cognition tends to be high (analysis, synthesis, evaluation) and related to similarly high levels of teacher cognition (analysis, synthesis). (Factor 3) When teacher cognition is central, student cognitive behavior is likely to remain fixed at the lowest cognitive level, knowledge. (Factor 9) Although the nature of the evidence requires that this conclusion be accepted tentatively, indications are clear that the role of students in the classroom, whether central or peripheral, is important in the cognitive as well as the affective dimension of classroom behavior.

High levels of teacher cognition (analysis, synthesis, evaluation) are closely related to definite levels of cognition as measured by the Taxonomy of Image Provocation. It is interesting to note, however, that the highest levels of teacher cognition (synthesis and evaluation) are positively related to concrete classroom experiences, whether with or without imagery, and negatively related to abstract classroom experiences whether with or without imagery. It is the proximity to concreteness, on this concrete-abstract continuum which appears to be congruent with high level teacher cognition. Evidence to support this conclusion may be found on Factor 7 and Factor 10.

Experimental teacher practices show rather consistent relationships to teacher and student cognitive behavior. The Development of Ideas Category of Experimentalism appears on Factor 3 along with student-teacher cognition. Such practices as "T asks P to suggest alternative answers," "T asks P to judge comparative value of answers or suggestions," "T encourages P to guess or hypothesize about the unknown or untested," "T asks P to support answer or

opinion with evidence," are related to student synthesis (creativity), analysis, evaluation and application. Teacher cognition at the analysis and synthesis levels are also congruent with the above experimental practices.

The highest level of teacher cognition, evaluation, is closely related to an experimental "Nature of the Situation" by virture of loading together on two separate factors. An experimental setting where "T makes P center of attention," "T has P participate actively," "T joins or participates in P's activities," "T encourages P to express self freely," and teacher evaluation level cognition are mutually facilitative. Evidence to support this conclusion may be found on Factors 5 and 7.

As teachers increase their use of climate warming behavior, students increase their classroom participation and verbal flexibility. This conclusion, reached by way of Factor 2 in the present study, is similar to findings of several previous studies (i.e. Whithall, Flanders, Anderson, Hough, Ober, Wood, et al).

Teachers consistently express a desire to increase student participation, to motivate students, to "reach" students. The cumulative weight of evidence suggests that student classroom participation is closely related to the nature of the socio-emotional climate, and, further, that the warmer the climate (or the more indirect the teacher behavior) the more likely students will participate actively. Students are not threatened in a warm climate and are less reluctant to express themselves freely and openly.

The erratic use of divergent categories of teacher verbal behavior is related to student climate cooling. This conclusion is reached only with the greatest caution, since much of the support is rather subjective. (Factor 4).

Teacher initiation (lecture) and student initiation are positively related to each other and to grade level, but negatively related to teacher questions, convergent student responses, and teacher evaluation level cognition. Or, more

simply, as teacher and student initiation and grade level increase, the negatively related measures decrease. Supporting evidence for this conclusion is found on Factor 5. Such a conclusion implies that classroom management approaches vary with grade level. At lower grade levels, a question-answer approach is prevalent but, as grade level increases so do teacher initiation (lecture) and student initiation.

Further relationships invovling student and teacher initiation were discussed on two additional factors. Factor 8 shows teacher and student initiation related to each other but negatively related to teacher directions and silence. On Factor 11, student initiation is positively related to three levels of student cognition, while teacher initiation and grade level load oppositely. Findings on these related factors suggest that teacher and student initiation are mutually compatible in the affective dimension, but contraproductive when coupled with the cognitive dimension of classroom behavior.

In attempting to analyze data yielded by the multidimensional technique, the most important conclusion thus far derived from our studies signals the direction which future classroom behavior research might take, and says something about the nature of the variables with which we must deal.

It is clear that those elements of classroom behavior which have been identified exist in a state of dynamic interaction. Admittedly, those variables may be isolated, listed out of context as it were, and submitted to countless analytical procedures. In the view of the authors errors of the grossest magnitude are committed, however, when variables lifted out of their dynamic context are treated as static entities. Our research identifies two unproductive blind alleys in which the unwary researcher may find himself; one theoretical, the other methodological.

The theoretical pitfall may involve making judgments about dynamic process from isolated parts. Such assumptions put one in a dilemma similar to that

of blind men hypothesizing about the nature of an elephant, each having examined a different part of the beast. We seek to avoid such errors by assuming that a clearer picture of the totality of classroom behavior will emerge if viewed simultaneously from a variety of vantage points.

The methodological error has been committed by some researchers who, in designing their studies, have mistakenly believed that anything less than an "experimental" design is lacking in scientific respectability. Often these "experimental" studies have attempted to establish cause-effect relationships between dynamically interactive variables.

It is a truism to state that the measures of classroom behavior we observe, and the variables we manipulate are infinitely complex. Our behavior belies the fact that we understand such a truism, however, when we attempt to establish simple cause-effect relationships stemming from complex processes of classroom behavior. Rather, most of the variables with which we must concern ourselves appear to be mutually casual. More precisely, the authors see these variables operating in a teleological system where it might be said that there is circularity of causality.

Consider such variables as student achievement and a positive view of self. The body of available knowledge suggests that there are elements of causality in both. As achievement increases, view of self becomes more positive with regard to that activity. Or, if self view becomes more positive with regard to a particular cognitive activity, achievement in that area tends to increase. Which causes which is an irrelevant question. Instead of a simple cause-effect relationship ($A \rightarrow B$) we have at least a reciprocity in causality ($A \leftrightarrow B$), and perhaps a circularity in causality.

We choose to work with associational variables. We look for relationships between and among these variables, and can only make such statements as the following:

Where we find variable X, variable Y tends to be found.

Where variable X is found, variable Y is rarely ever or never found.

As variable X increases, variable Y increases.

As variable X increases, variable Y descreases.

However, when additional dimensions of classroom behavior are observed (as with the multidimensional technique) the complexity of findings appears to increase exponentially. We begin to find that the added dimensions sometimes have a mediating relationship to simpler sets of relationship previously found. (i.e. variable X increases as variable Y increases most often, or only, when variable Z is present).

It would appear, then, that while conventional methods of unidimensional observation and analysis do contribute to the understanding of complex classroom processes, the value of utilizing multidimensional approaches can significantly broaden observational perception and analytical procedures as shown by the relationships indicated in this study.

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FACTOR 1

IMAGERY

VARIABLE NUMBER		LOADING
52	TOTAL IMAGERY	.97
46	VISUAL CONCRETE	.81
49	NON VISUAL REPRESENTATION	.80
48	VISUAL REPRESENTATION	.77
50	VISUAL ABSTRACT	.77
51	NON VISUAL ABSTRACT	.68
47	NON VISUAL CONCRETE	.62
31	STUDENT COGNITION 4. APPLICATION	.51
21	TEACHER COGNITION 2. TRANSLATION	.36
23	TEACHER COGNITION 4. APPLICATION	.36
41	TPOR EXPERIMENTALISM 6. DIFFERENTIATION	.35
24	TEACHER COGNITION 5. ANALYSIS	.34
45	ABSTRACT WITHOUT IMAGERY	-.81

FACTOR 2

WARM CLASSROOM CLIMATE

VARIABLE NUMBER		LOADING
11	STUDENT WARM CLIMATE	.98
12	STUDENT ACCEPTANCE	.98
17	STUDENT DIRECTIONS	.95
14	STUDENT QUESTIONS	.86
1	TEACHER WARMS CLIMATE	.80
18	STUDENT CORRECTION	.74
13	STUDENT AMPLIFY-CLARIFY	.57

FACTOR 3

STUDENT COGNITIVE

VARIABLE NUMBER		LOADING
33	STUDENT COGNITION 6. SYNTHESIS	.82
27	TEACHER COGNITION MEDIAN	.74
35	STUDENT COGNITION MEDIAN	.73
24	TEACHER COGNITION 5. ANALYSIS	.72
32	STUDENT COGNITION 5. ANALYSIS	.68
34	STUDENT COGNITION 7. EVALUATION	.67
25	TEACHER COGNITION 6. SYNTHESIS	.42
31	STUDENT COGNITION 4. APPLICATION	.30
38	EXPERIMENTAL DEVELOPMENT OF IDEAS	.30

FACTOR 4

COOL CLASSROOM CLIMATE

VARIABLE NUMBER		LOADING
19	STUDENT COOL CLIMATE	.90
3	TEACHER AMPLIFY-CLARIFY IDEAS	.89
5	TEACHER ANSWER QUESTIONS	.84
8	TEACHER CORRECTIONS	.79
7	TEACHER DIRECTIONS	.72
2	TEACHER ACCEPTANCE	.69
13	STUDENT AMPLIFICATION	.62

FACTOR 5

STRUCTURING RESPONSE VS INITIATION

VARIABLE NUMBER		LOADING
15	STUDENT ANSWER QUESTIONS	.86
4	TEACHER QUESTIONS	.81
36	EXPERIMENTALISM 1. NATURE OF SITUATION	.46
26	TEACHER COGNITION 7. EVAULATION	.31
53	GRADE LEVEL	-.31
6	TEACHER INITIATION (LECTURE)	-.32
16	STUDENT INITIATION	-.38

FACTOR 6

EXPERIMENTALISM

VARIABLE NUMBER		LOADING
43	EXPERIMENTALISM SCORE	.92
42	TPOR 7	.86
37	TPOR 2	.75
38	TPOR 3	.72
40	TPOR 5	.68
39	TPOR 4	.58
41	TPOR 6	.46
36	TPOR 1	.40

FACTOR 7

CONCRETE COGNITION VS ABSTRACT

VARIABLE NUMBER		LOADING
26	TEACHER COGNITION 7. EVALUATION	-.65
47	NON-VISUAL CONCRETE WITH IMAGERY	-.45
36	EXPERIMENTALISM 1. NATURE OF SITUATION	-.31
51	NON-VISUAL ABSTRACT WITH IMAGERY	.35

FACTOR 8

INITIATION VS DIRECTION AND SILENCE

VARIABLE NUMBER		LOADING
6	TEACHER INITIATION	.52
16	STUDENT INITIATION	.41
7	TEACHER DIRECTIONS	-.39
10	SILENCE AND/OR CONFUSION	-.85

FACTOR 9

TEACHER COGNITION

VARIABLE NUMBER		LOADING
20	TEACHER COGNITION 1. KNOWLEDGE	.82
22	TEACHER COGNITION 3. INTERPRETATION	.73
21	TEACHER COGNITION 2. TRANSLATION	.57
23	TEACHER COGNITION 4. APPLICATION	.54
28	STUDENT COGNITION 1. KNOWLEDGE	.54

FACTOR 10 CONCRETE VS ABSTRACT WITHOUT IMAGERY		
VARIABLE NUMBER		LOADING
44	CONCRETE WITHOUT IMAGERY	.66
25	TEACHER COGNITION 6. SYNTHESIS	.44
45	ABSTRACT WITHOUT IMAGERY	-.32

FACTOR 11 STUDENT INITIATION AND COGNITION VS TEACHER INITIATION		
VARIABLE NUMBER		LOADING
29	STUDENT COGNITION 2. TRANSLATION	.67
30	STUDENT COGNITION 3. INTERPRETATION	.59
28	STUDENT COGNITION 1. KNOWLEDGE	.51
16	STUDENT INITIATION	.38
53	GRADE LEVEL	-.47
6	TEACHER INITIATION	-.59